



Amendment to the Claims

WE CLAIM:

1. (currently amended) A spin valve device comprising:

 A a ferromagnetic free layer whose magnetization changes in a magnetic signal field,

 A a ferromagnetic pinned layer whose magnetization remains unchanged in the magnetic signal field,

 A a single or a plurality of carbon nanotubes reside between the said ferromagnetic free layer and said pinned layer, and are in electrical contact with the two, wherein The nanotubes said carbon nanotube each having a substantially cylindrical wall, having a submicron diameter, and a length measured in a direction perpendicular to the diameter, and the length being greater than the diameter,

wherein the plane of the said ferromagnetic pinned layer is parallel to the plane of the said free layer, and

the said carbon nanotubes are vertically aligned and perpendicular to the planes of the said pinned and the said free layers, and

During the device operation, an electrical current passes from one ferromagnetic layer to the other via the said carbon nanotubes During the device operation.

2. (currently amended) The spin valve device of claim 1, wherein the said carbon nanotubes are single wall nanotubes.

3. (currently amended) The spin valve device of claim 1, wherein the said ferromagnetic free layer is made of alloys selected from the group containing Ni, Fe, Co.

4. (currently amended) The spin valve device of claim 1, wherein the said spin valve device is a magnetic recording read head.

5. (currently amended) The magnetic recording read head of claim 4, wherein

The said ferromagnetic free layer is between two soft magnetic shields, and

The said ferromagnetic pinned layer is not between the two soft magnetic shields, and

 A said single or a plurality of vertically aligned carbon nanotubes reside between the said free layer and the said pinned layer, extend extending through the thickness of one of the shields.

6. (currently amended) The magnetic recording read head of claim 4, wherein the spin valve fabrication processes is fabricated by a process comprising:

~~Growth of growing~~ carbon nanotubes on patterned free layer by chemical vapor deposition, and

~~Deposition of~~ depositing an insulation layer, and

~~Deposition of~~ depositing a soft magnetic shield layer, and

~~Chemical~~ chemical mechanical polishing of the said shield layer and exposing the top of said carbon nanotubes, and

~~Deposition~~ depositing and patterning of said ferromagnetic pinned layer.

7. (currently amended) The spin valve device of claim 1, wherein ~~the~~ said spin valve is included in a magnetic random access memory (MRAM) cell.

8. (currently amended) The MRAM cell of claim 7, wherein the spin valve ~~fabrication processes~~ is fabricated by a process comprising:

~~Growth of growing~~ carbon nanotubes on patterned free layer by chemical vapor deposition, and

~~Deposition of~~ depositing an insulation layer, and

~~Chemical~~ chemical mechanical polishing of the said insulation layer and exposing the top of carbon nanotubes, and

~~Deposition~~ depositing and patterning of said ferromagnetic pinned layer.

9. (currently amended) A spin valve device comprising:

~~A~~ a ferromagnetic free layer whose magnetization changes in a magnetic signal field,

~~A~~ a ferromagnetic pinned layer whose magnetization remains unchanged in the magnetic signal field,

~~A~~ a single or a plurality of carbon nanotubes reside between the said ferromagnetic free layer and said pinned layer, and are in electrical contact with the two, wherein ~~The nanotubes~~ said carbon nanotubes each having a substantially cylindrical wall, having a submicron diameter, and a length measured in a direction perpendicular to the diameter, and the length being greater than the diameter,

wherein ~~The~~ said ferromagnetic pinned layer resides substantially in the same plane of ~~the~~ said free layer, and

~~The~~ said carbon nanotubes are in-plane aligned and are substantially in the same plane of ~~the~~ said pinned and ~~the~~ said free layers, and

~~During the device operation~~, an electrical current passes from one ferromagnetic layer to

the other via the said carbon nanotubes during the device operation.

10. (currently amended) The spin valve device of claim 9, wherein the said carbon nanotubes are single wall nanotubes.

11. (currently amended) The spin valve device of claim 9, wherein the said ferromagnetic free layer and pinned layer are made of alloys selected from the group containing Ni, Fe, Co.

12. (currently amended) The spin valve device of claim 9, wherein the said spin valve device is a magnetic recording read head.

13. (currently amended) The magnetic recording read head of claim 12, wherein

The said ferromagnetic free layer is exposed to the air bearing surface, and resides between two soft magnetic shields,

The said ferromagnetic pinned layer is recessed from the air bearing surface, and does not overlap the said free layer,

A said single or a plurality of in-plane aligned carbon nanotubes reside between the said free layer and the said pinned layer, and are aligned in a direction substantially perpendicular to the air bearing surface.

14. (currently amended) The magnetic recording read head of claim 12, wherein the spin valve fabrication processes is fabricated by a process comprising:

Patterning of patterning a said ferromagnetic free layer and a said ferromagnetic pinned layer, and

Growth of growing in plane aligned carbon nanotubes between the said free layer and the said pinned layer by chemical vapor deposition.

15. (currently amended) The magnetic recording read head of claim 12, wherein the spin valve fabrication processes comprising:

Patterning of patterning a ferromagnetic free layer and a ferromagnetic pinned layer, and

Assembling of assembling carbon nanotubes between the said free layer and pinned layer.

16. (original) The spin valve device of claim 9, wherein the spin valve is included in a magnetic random access memory (MRAM) cell.

17. (currently amended) The MRAM cell of claim 16, wherein the spin valve fabrication processes is fabricated by a process comprising:

Growth of growing carbon nanotubes on patterned free layer by chemical vapor deposition, and

Deposition of depositing an insulation layer, and

Chemical chemical mechanical polishing of the said insulation layer and exposing the top of carbon nanotubes, and

Deposition depositing and patterning of said ferromagnetic pinned layer.

18. (currently amended) The MRAM cell of claim 16, wherein the spin valve ~~fabrication processes is fabricated by a process~~ comprising:

Patterning patterning of a ferromagnetic free layer and a ferromagnetic pinned layer, and

Assembling assembling of carbon nanotubes between the said free layer and said pinned layer.